



# McCALL FISH HATCHERY

## 2001 Summer Chinook Salmon Brood Year Report

**By:**

**Donald E. McPherson, Fish Hatchery Manager II**
**Steven Kammeyer, Assistant Fish Hatchery Manager**
**Joel Patterson, Fish Culturist**
**Doug Munson, Fish Pathologist**

**IDFG 03-54**
**October 2003**

## TABLE OF CONTENTS


| | Page |
|---|---|
| ABSTRACT | 1 |
| INTRODUCTION | 2 |
| OBJECTIVES | 2 |
| FISH REARING FACILITIES | 2 |
| WATER SUPPLY | 3 |
| STAFFING | 3 |
| TRAPPING AND SPAWNING | 4 |
| FISH PRODUCTION | 6 |
| Early Rearing | 6 |
| FISH HEALTH | 6 |
| Diseases Encountered and Treatment | 6 |
| Organosomatic Index | 7 |
| Acute Losses | 7 |
| Other Assessments | 7 |
| FISH MARKING | 7 |
| FISH DISTRIBUTION | 7 |
| EXPERIMENTS. | 7 |
| CONCLUSIONS | 8 |
| RECOMMENDATIONS | 8 |
| APPENDICES | 9 |


## APPENDICES


| | | |
|---|---|---|
| Appendix 1. | 2001 summer chinook returns to McCall Fish Hatchery, South Fork Salmon River, based on CWT and length frequency data age distribution of brood year | 10 |

## TABLE OF CONTENTS (continued)


**Page**

Appendix 2. Lengths of brood year 2001 fish trapped at McCall Hatchery ..... 11

Appendix 3. Length frequency of Brood Year 2001 summer chinook at the South Fork of the Salmon River trap, according to mark type ..... 13

Appendix 4a. South Fork Salmon River female summer chinook female length frequency graph BY01 ..... 15

Appendix 4b. South Fork Salmon River male summer chinook male length frequency graph BY01 ..... 16

Appendix 5. McCall Fish Hatchery 2001 Summer Chinook run timing, South Fork Salmon River ..... 17

Appendix 6. McCall Fish Hatchery South Fork Salmon River chinook run timing graph BY01 ..... 18

Appendix 7. Historic hatchery releases and returns logged at McCall Fish Hatchery ..... 19

Appendix 8. Summer chinook distribution in the South Fork of the Salmon River logged at McCall Fish Hatchery ..... 20

Appendix 9. Brood year 2001 summer chinook survival from green eggs to released smolts ..... 20

Appendix 10. Temperature range from August 2001 through April 2003 at McCall Fish Hatchery ..... 21

Appendix 11. Water analysis at McCall Fish Hatchery ..... 22

Appendix 12. Brood year 2001 production cost table ..... 22

Appendix 13. Brood year 2001 marked fish released ..... 22

Appendix 14a. Summary of fish autopsy ..... 23

Appendix 14b. Summary of fish autopsy ..... 24

## ABSTRACT

The South Fork Salmon River trapping season began on May 31, with the weir installation and opening of the trap. Trapping operations concluded on September 17, 2001.

Chinook salmon Oncorhynchus tshawytscha spawning at the trap commenced on August 17 and concluded on September 17, 2001. A total of 10,922 returning chinook salmon were trapped, measured, and recorded during this period. The overall average eye-up from eggs taken from the South Fork stock was 74.5%.

Of the 10.922 fish trapped: 4,204 were females, of which 1,069 were ponded; 882 were released above the weir. The pre-spawn mortality for females was 24.7%. There were 5,626 adult males trapped of which 1,550 were released above the weir. The pre-spawn mortality for the males was 21.2%. There were 1,092 jacks trapped (according to length frequency criteria). 213 were released, 25 were used for spawning. Due to the high numbers of reserve adults and jacks, there were 2,009 given to the tribes or charitable organizations.

From the females ponded, 417 South Fork stock were spawned with an average fecundity rate of 4,354 eggs per female, resulting in 1,793,667 green eggs taken. There were 28 Johnson Creek females held and spawned, resulting in 80,753 green eggs. There were 80 reserve female and 84 reserve male adult salmon transported and held for spawning at the Sawtooth Hatchery for the Sho-Ban tribal egg box program.

During the period of March 31,through April 3, 2003, there were 1,053,660 brood year 2001 smolts weighing 49,900 pounds transported and released at Knox Bridge. Nez Perce tribal fishery personnel transported 73,000 Johnson Creek stock smolts to Johnson Creek for release.



Author:

Donald E. McPherson
Fish Hatchery Manager II

Steven Kammeyer
Assistant Fish Hatchery Manager

Joel Patterson
Fish Culturist

Doug Munson
Fish Pathologist

## INTRODUCTION

McCall Fish Hatchery (MCFH) was built in 1979 as a result of the Water Resources Development Act enacted by Congress in 1976. A portion of this Act is the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP). The LSRCP compensates Idaho for fish and wildlife losses caused by the Lower Snake River Projects (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams). The MCFH was the first hatchery built as a partial fulfillment of the LSRCP. Funding for LSRCP is administered to the Idaho Department of Fish and Game (IDFG) by the U.S. Fish and Wildlife Service.

The MCFH is located within the city limits of McCall, Idaho along the North Fork of the Payette River, approximately 0.16 km (1/4 mile) downstream from Payette Lake.

A satellite facility for trapping and spawning adult chinook salmon Oncorhynchus tshawytscha is located on the South Fork Salmon River near Warm Lake, approximately 26 miles east of Cascade, Idaho.

The main production for MCFH is summer chinook reared to smolt size. There is also a resident trout program funded solely by IDFG.

The first salmon reared at the MCFH were transferred in from the Mackay Fish Hatchery and the Dworshak/Kooskia National Fish Hatchery complex. These eggs were the products of adult summer chinook trapped at Little Goose and Lower Granite dams. The first eggs from the South Fork of the Salmon River were received in August 1980.

## OBJECTIVES

The mitigation goal is to return 8,000 adult summer chinook salmon above Lower Granite Dam. The objectives of the MCFH are:

Restore summer chinook salmon to the South Fork Salmon River; historically a major summer chinook stream in Idaho.

Trap and spawn adult salmon returning to the South Fork Salmon River.

Raise 1,000,000 summer chinook smolts for release into the South Fork Salmon River.

Work with management and research to identify optimum operating procedures for the MCFH.

## FISH REARING FACILITIES

The hatchery facility consists of six buildings on approximately 15 acres. The largest building consists of a shop, parking garage, incubation and early rearing area, generator room, and feed/freezer room. The office and a three-bedroom dormitory are contained in one building. There is a visitor center with restrooms, a flow chart for a self-guided tour, and historical information signs. There are three residences for permanent personnel also located on the site.

The fish production facilities include:

1. Twenty-six eight-tray stacks of FAL (Flex-A-Lite, Consolidated) vertical flow (Heath type) incubators.

2. Fourteen concrete vats 4-ft x 40-ft x 2-ft (water depth); 320 cubic feet of rearing area per vat.

3. Two concrete rearing ponds 196-ft x 40.5-ft x 4-ft (water depth); 23,814 cubic feet of rearing space per pond.

4. One concrete collection basin 101-ft x 15-ft x 4-ft (water depth). The hatchery is designed to raise a maximum capacity of 1,000,000 smolts, averaging 17 fish per pound.

An adult trapping and spawning facility is located on the South Fork of the Salmon River near Warm Lake. This facility is equipped with a removable weir, fish ladder, trap, two adult holding ponds (10-ft x 90-ft), and a covered spawning area. Water is supplied from the South Fork Salmon River through a 33-inch underground pipeline. Holding capacity for the facility is approximately 1,000 adult salmon. Some adults are passed above the weir to spawn naturally, with an additional group transported to Stolle Meadows for Idaho Supplementation research. Eggs collected at the facility are transported "green" to MCFH for incubation and rearing.

## WATER SUPPLY

Hatchery water is obtained by gravity flow from Payette Lake through a 36 inch underground pipeline. Water may be taken from the surface or up to a depth of 50 ft, thus providing the capability of obtaining optimum rearing water temperatures.

Through an agreement with the Payette Lake Reservoir company, 20 cubic feet per second (cfs) of water flow is available for hatchery use. Design criteria and production goals were established using this constraint, ensuring the hatchery has enough water to meet its production goals.

Water quality analysis reveals a somewhat "distilled" system for rearing fish (Appendix 12). The pH stays about 6.8. There is no indication of problems with heavy metals and temperature is maintained at 52(F to 56(F, with a low of 37(F.

## STAFFING

The hatchery is staffed with three permanent employees: a Hatchery Manager II, an Assistant Hatchery Manager, and a Fish Culturist. In addition, there are five temporary employees to assist during the busy field season.

## TRAPPING AND SPAWNING

The 2001 trapping season started on May 31, with the ponds set up and water turned on in the fish ladder, and weir installation. The first fish was trapped on June 3. Trapping continued through September 17, 2001. Normal trap installation is usually around June 20 with the fish arriving shortly thereafter. The peaks of the run for 2001 were June 22, July 16, and August 29.

There were 10,922 fish trapped; 4,204 (38.5%) were females, and 6,718 (61.5%) were males. A total of 1,092 male fish (16.3%) were jacks (three-year-old-fish) according to length frequency criteria. There were 882 females, 1,338 adult males, and 213 jacks released upstream of the weir.

Trap data obtained from the fish included fork length, sex, and mark type. All of the fish were also checked for internal and external tags.

The run was comprised of 9,144 marked (83.7%) and 1,778 (16.3%) unmarked fish. Of the 8,278 AD clipped reserve fish trapped 1,064 (12.9%) were noted as having a partial adipose fin. In addition there were 134 (40 females and 94 males) previously trapped and released adipose clipped fish that were re-trapped. Re-trapped fish numbers were down significantly from last year (641). Of the tags recovered or detected, 363 were PIT tags, 226 CWT,13 jaw tags, 17 radio tags, and 1Floy tag.

A total of 198 coded wire tags were detected in unclipped fish. These were either supplementation fish released by the Nez Perce tribe as parr in 1998 (100% coded wire tagged w/o fin clip) or supplementation fish reared through parr in the Stolle acclimation pond (100% coded wire tagged w/o fin clip). These fish were recorded as unmarked fish in the database. Detection and recovery of the tags was important to identify potential year class survival and differentiate between the two parr release groups.

Of the 50 pit tags recovered from unmarked fish, 28 were determined to be hatchery origin fish after one fish histories were reviewed in the Ptagis database. The jaw tags recovered were part of a tangle net study on the Columbia River being performed by the Washington Dept. of Fish and Wildlife. The radio tags detected were part of a migration study on adult salmon in the lower Snake and Salmon rivers conducted by the University of Idaho. The age-class determination by length frequency was used at the trap site during initial trapping. The CWT recovery data and scale analysis show an overlap of age-classes originally determined using length frequency (Appendix 1).

Fork lengths were taken on all of the fish trapped, and all of the adult fish were injected with Erythromycin (Erythro 200) at a rate of 10 mg/kg.

Of the total number of fish released, 2,433 (1,338 males, 882 females, 213 jacks) were released above the weir, at the time of trapping. There were 60 supplementation and no mark fish transported to Stolle meadows and released. The percent release for unmarked males and females was 95.5% and 94.5% respectively. A 1:1 ratio was required by NMFS in the IDFG trapping permit. There were 1,976 reserve fish transported to a site near Dollar Creek and a site upstream of,Goat Creek to be recycle through the fishery, of these, 48 were recaptured fish. There was 100 pair of reserve adults transported and released into the East Fork of the South Fork near Stibnite. There were 80 reserve female and 84 reserve male South Fork stock were

removed from the trap and transported to Sawtooth Fish Hatchery. Sawtooth hatchery personnel spawned these fish and eyed the resulting eggs. ShoBan tribe representatives received the eyed eggs (243K) for placement into in-stream egg incubation boxes located in the South Fork Salmon River drainage. Nez Perce fisheries personnel and McCall hatchery staff also transported 100 reserve female and 100 reserve male South Fork stock to the East Fork of the South Fork Salmon River near the Stibnite mine. These fish were opercle tagged and released at two sites in Meadow Cr. (tributary to the EFSF) and one site on the EFSF. Release numbers to Meadow Cr. totaled 105 fish while 83 were released directly to the EFSF. This action was taken to alleviate excess numbers of adipose clipped fish from being held and to provide in-stream fish production in an area devoid of natural production. Hatchery personnel also transported and released 1,053 reserve fish to Panther Cr. for a consumptive fishery. There were 2,009 reserve adult and jack salmon killed for consumptive purposes and given to tribal and non-profit organizations

A total of 3,168 SFSR stock adults were held for hatchery production. Pre-spawn mortality for the females was 24.7%, with 21.2% for the males. It is likely that low water conditions in conjunction with warmer water temperature contributed to the increased mortality rate. Nez Perce fisheries staff held 166 summer chinook salmon from Johnson Cr. on site at the South Fork trap, 57 females and 109 males (32 jacks). These fish were initially ponded with the South Fork stock. At primary sort Johnson Creek males were moved into a circular holding tank. This was done to eliminate the need for excess sorting of South Fork males during spawning. Johnson Creek females were held along with SFSR females throughout spawning. All Johnson Cr. fish were uniquely marked to distinguish them from South Fork stock. Multiple marks were used to ensure positive identification. A total of 28 females were spawned, two were culled, producing 80,753 eyed eggs (76.8% eye up). Fecundity was 4,137 eggs/female.

Spawning operations began on August 17th and concluded on September 7th. Tuesdays and Fridays were reserved for spawning. A total of 8 spawn days were needed to spawn 417 South Fork females, resulting in 1,793,667 green eggs. The mark type breakdown was 396 adipose clip, 11 left ventral clip, and 10 unmarked.

Spawning procedures remained relatively consistent with recent years. Reserve fish were spawned with reserve fish; supplementation with supplementation; supplementation with unmarked; and unmarked with unmarked. All spawned out carcasses were returned to the river. Approximately 25 jacks were used in the spawning process. The eggs from one female were halved into two colanders and fertilized with two males producing a male to female ratio of 2 to 1. The colanders were then placed into activation buckets for approximately two minutes. The eggs were then recombined and placed in an iodine (100ppm) solution and allowed to harden for one hour. After hardening, the eggs were placed in numbered egg tubes and packed in coolers for transportation back to the hatchery.

Reserve females were double loaded into hatchery incubation egg trays. Eggs from supplementation and unmarked fish were single loaded. This was done to allow eggs from listed fish to be culled individually if needed. Ovarian fluid was collected from a sample of females by pathology personnel and tested for viruses. Kidney samples were collected from all spawned females to assess BKD levels through ELISA testing. ELISA optical density values of 0.25 or greater were considered high positive for bacterial kidney disease. Females with values of 0.25 or greater were culled out from the population. A total of 35 females returned ELISA values of 0.25 or greater. One of these was a listed fish. Four hatchery females were culled during spawning operations due to exhibiting gross clinical signs consistent with BKD. One

green female was also culled. Trays with double females lost two fish, bringing the total effective number of females culled to 62. There was a total of 270,015 South Fork stock eggs culled out due to BKD. Overall average fecundity was 4,354 eggs/female and average eye up was 74.5 %.

Incubator flows were set at a five gallon per minute rate, and incubators were loaded at two females per tray due to space concerns. The eggs were treated with 1,667 ppm of formalin for 15 minutes starting three days after fertilization and continuing on a daily basis until the eggs started to hatch.

Eggs eyed-up at approximately 600 thermal units (TU) and were then shocked, picked, and enumerated. Hatching began at approximately 925 TU.

## FISH PRODUCTION

### Early Rearing

Fry were sent out to the concrete vats approximately three days prior to initial feeding. Initial feeding begins between 1,750 and 1,775 TU. Flows for the vats are set at 80 gallons per minute and are loaded at 30,000 to 55,000 fish per vat, depending on the number of fish on hand. The vats start at half length and are extended to full length when the density index (DI) reaches 0.30 to 0.35, usually around mid-February.

Beginning growth rates are slow, only 0.003-inch to 0.004-inch per day, due to cold water temperatures of only 37(F to 39(F. The fry are started on BioDiet #2 and #3 feed and remain on #3 until they reach 700 fish per pound. BioDiet feed has been used successfully at MCFH, using modified feed rates. The conversion rates average 1.1:1 to 1.5:1 during the fry-rearing stage.

Fish are moved to the outside rearing ponds mid June and mid July. They are adipose clipped, ventral clipped and coded wire tagged (CWT), and enumerated as they are moved to the ponds. There were 61,800 supplementation fish moved to the Stolle Meadows acclimation pond on July 16 and 17. By the end of August, there were 1,055,985 fish on station. There also 73,861 Johnson Creek stock for Nez Perce tribal releases in to Johnson Creek.(Appendix 13).

## FISH HEALTH

### Diseases Encountered and Treatment

Epizootics were not encountered during the rearing cycle that ended with release in the Spring of 2003. Two prophylactic treatments of erythromycin medicated feed were applied to chinook to control Renibacterium salmoninarum, the causative agent of Bacterial Kidney Disease, at target dose of 100 mg/KG for 28 days. Adult chinook entering the South Fork Trap were given an intra-peritoneal injection of erythromycin at a target dose of 20 mg/KG.

Renibacterium was detected via ELISA technology in juveniles and brood fish. Infectious Hematopoietic Necrosis Virus (IHNV) was detected during routine brood stock inspections at the South Fork Trap.

**Organosomatic Index**

Summary of Fish Autopsy (Appendices 14a. and 14b.)

Acute Losses

Neither acute nor chronic losses were experienced at McCall Hatchery during this brood year.

Other Assessments

Since the supplementation program has ended, the McCall Hatchery Staff will be taking and incubating chinook eggs for the SBT egg box program for the South Fork of the Salmon River. Coordination of this program will be another project added to a very busy time of the year.

IHNV seems to be increasing in the anadromous stocks in the Pacific Northwest. We have seen increased detection in Idaho stocks. In 2002, IDFG personnel detected an IHNV epizootic at Sawtooth Hatchery that caused an epizootic. Awareness, prevention, and disinfection will be the key to controlling this etiologic agent.

## FISH MARKING

The fish marking crew was here in June and July and marked approximately 1.19 million fish. These fish receive Ad clips, CWT/Ad-clips, and CWT only.

The marking crew returned in February and Passive Integrated Transponder (PIT) tagged 74,597 fish. The breakdown of tagged released fish appears in Appendix 13.

## FISH DISTRIBUTION

The brood year 2001 smolt hauling operation began on March 31 and concluded on the evening of April 3. There were approximately twenty-eight loads of fish hauled in four days. The river conditions were clear and low at the time of release. All together there were 1,053,660 year 2001 smolts at 21.12 fish per pound totaling 49,900 pounds released (Appendix 8).

Nez Perce Tribal fishery personnel transported 73,000 smolts to Johnson Creek on March 20-21, for release.

## EXPERIMENTS

The supplementation research carried over to the brood year 2001 chinook. This project is designed in an attempt to generate more returning adults to natural spawning grounds. Supplementation smolts are the prodigy of unmarked adults. These fish were isolated within the

hatchery until they could be differentially marked to ensure that genetic crossover with hatchery production fish would not occur. There were 61,800 supplementation fish, (CWT only plus 600 PIT), released into the acclimation pond that was renovated near Stolle Meadows. These fish are to be volitionally released in the fall of 2002.

Low phosphate feed with a higher vitamin pack was utilized on the brood year 1999 fish with no adverse effects noted. This resulted in a reduction of total phosphorous in the hatchery effluent water to the minimum detectable amount (Appendix 11).

## . CONCLUSIONS

The Brood Year 2001 summer chinook released from MCFH were in excellent condition at release time. The culling program utilized on the BKD high-positive eggs had a positive effect on the over-all health and condition of the fish. The release pipe and tempering pump were utilized again this year. The fish transport and stocking went smoothly despite slick snowy roads and adverse weather conditions.

## RECOMMENDATIONS

Low phosphate feed with a higher vitamin pack was utilized during the peak rearing cycle with no adverse effects noted. It is recommended to continue to utilizing low phosphate feed. All of the chinook eggs that tested high-positive for BKD were culled this year and should be continued as egg numbers will allow. The gabion baskets need to be replaced to make a stable footing for the weir as the existing ones have rotted out over time. The entire asphalt driveway for the hatchery is in need of extensive repair or replacement.

Submitted by:

Donald E. McPherson
Fish Hatchery Manager II

Steven Kammeyer
Assistant Fish Hatchery Manager

Joel Patterson
Fish Culturist

Doug Munson
Fish Pathologist

## APPENDICES

Appendix 1. 2001 summer chinook returns to McCall Fish Hatchery, South Fork Salmon River, based on CWT and length frequency data age distribution of brood year

.

| | Males | | Females | |
|---|---|---|---|---|
| Age | CWT* Estimate | Length/ frequency Estimate | CWT Estimate | Length/ frequency Estimate |
| 3 | 1,201 | 1,092 | 0 | 2 |
| 4 | 4,865 | 5,480 | 4,692 | 4,094 |
| 5 | 98 | 146 | 66 | 108 |
| **Totals** | **6,164** | **6,718** | **4,758** | **4,204** |

*CWT data based on 328 snouts recovered.
Length data is taken at trapping prior to first sort.

Age-class breakdown

66 cm = three-year-olds, jacks
67-89 cm = four-year-olds
90 cm = five-year-olds

Appendix 2. Lengths of brood year 2001 fish trapped at McCall Hatchery.

| Fork Length (cm) | Males | Females |
|---|---|---|
| 37 | 1 | 0 |
| 38 | 0 | 0 |
| 39 | 0 | 0 |
| 40 | 0 | 0 |
| 41 | 0 | 0 |
| 42 | 1 | 0 |
| 43 | 1 | 0 |
| 44 | 1 | 0 |
| 45 | 3 | 0 |
| 46 | 1 | 0 |
| 47 | 2 | 0 |
| 48 | 11 | 0 |
| 49 | 11 | 0 |
| 50 | 24 | 0 |
| 51 | 26 | 0 |
| 52 | 50 | 0 |
| 53 | 54 | 0 |
| 54 | 70 | 0 |
| 55 | 81 | 0 |
| 56 | 98 | 0 |
| 57 | 81 | 0 |
| 58 | 101 | 0 |
| 59 | 107 | 0 |
| 60 | 62 | 0 |
| 61 | 72 | 0 |
| 62 | 73 | 0 |
| 63 | 46 | 0 |
| 64 | 39 | 1 |
| 65 | 40 | 0 |
| 66 | 36 | 1 |
| 67 | 41 | 1 |
| 68 | 48 | 5 |
| 69 | 52 | 11 |
| 70 | 95 | 24 |
| 71 | 93 | 31 |
| 72 | 137 | 65 |
| 73 | 180 | 94 |
| 74 | 223 | 145 |
| 75 | 274 | 186 |
| 76 | 334 | 255 |
| 77 | 375 | 320 |
| 78 | 451 | 436 |
| 79 | 486 | 458 |
| 80 | 546 | 577 |
| 81 | 412 | 440 |
| 82 | 373 | 330 |

Appendix 2. continued

| Fork Length (cm) | Males | Females |
|---|---|---|
| 83 | 335 | 258 |
| 84 | 240 | 202 |
| 85 | 232 | 115 |
| 86 | 174 | 93 |
| 87 | 145 | 42 |
| 88 | 120 | 20 |
| 89 | 73 | 18 |
| 90 | 49 | 14 |
| 91 | 35 | 9 |
| 92 | 23 | 4 |
| 93 | 26 | 8 |
| 94 | 6 | 17 |
| 95 | 9 | 6 |
| 96 | 11 | 7 |
| 97 | 3 | 3 |
| 98 | 8 | 5 |
| 99 | 2 | 2 |
| 100 | 4 | 1 |
| 101 | 1 | 0 |
| 102 | 3 | 0 |
| 103 | 2 | 0 |
| 104 | 1 | 0 |
| 105 | 1 | 0 |
| 106 | 1 | 0 |
| 107 | 2 | 0 |
| Totals | 6,718 | 4,204 |

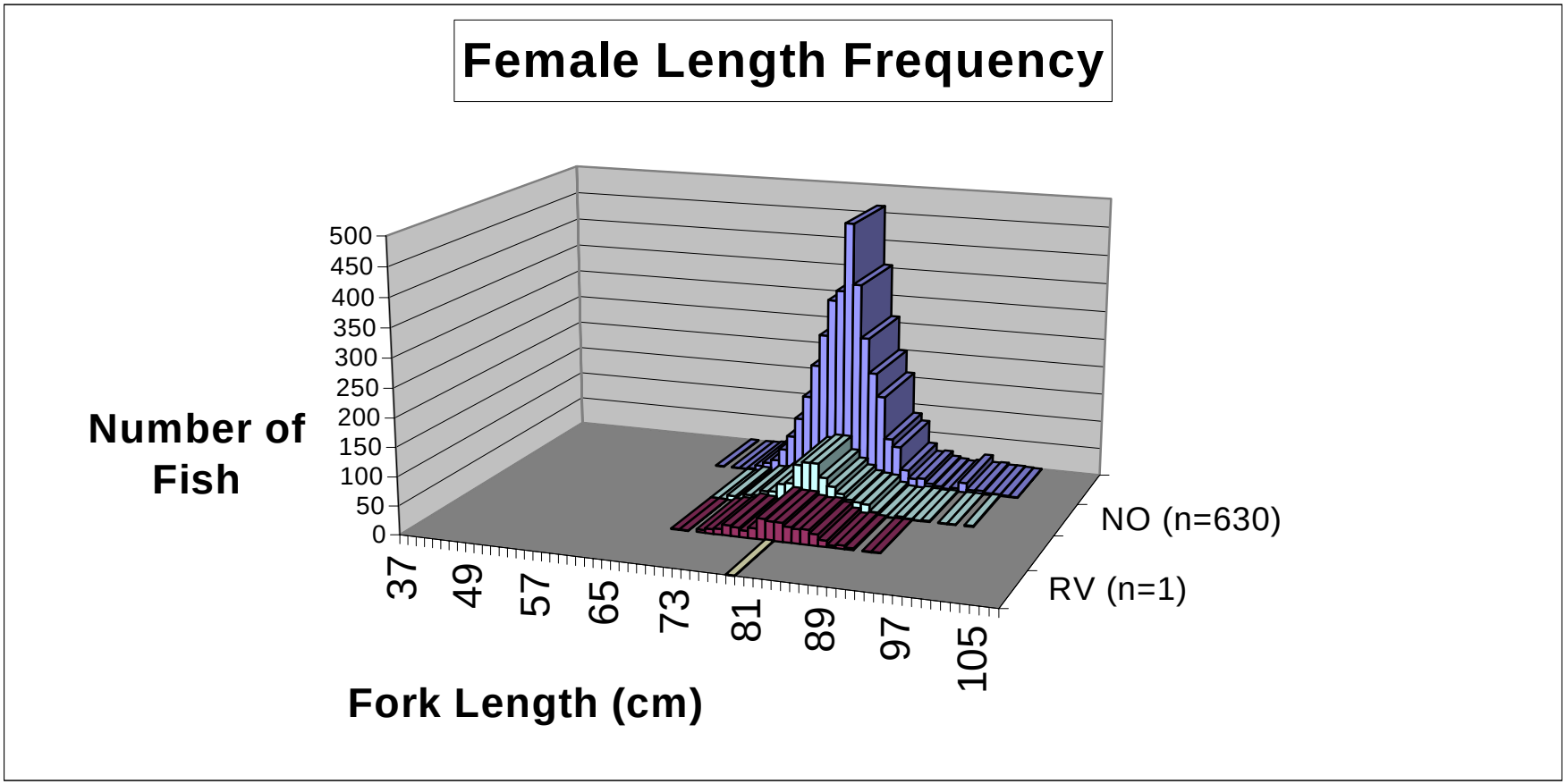
Appendix 3. Length frequency of Brood Year 2001 summer chinook at the South Fork of the Salmon River trap according to mark type.

| Fork | Female | | | | | Male | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Length (cm) | AD | LV | RV | NO | Sum F | AD | LV | RV | NO | Sum M | **TOTAL** |
| 37 | | | | | | | | 1 | | 1 | 1 |
| 42 | | | | | | | | 1 | | 1 | 1 |
| 43 | | | | | | | | 1 | | 1 | 1 |
| 44 | | | | | | 1 | | | | 1 | 1 |
| 45 | | | | | | 3 | | | | 3 | 3 |
| 46 | | | | | | | | | 1 | 1 | 1 |
| 47 | | | | | | 1 | | | 1 | 2 | 2 |
| 48 | | | | | | 8 | | 1 | 2 | 11 | 11 |
| 49 | | | | | | 9 | | 1 | 1 | 11 | 11 |
| 50 | | | | | | 18 | | | 6 | 24 | 24 |
| 51 | | | | | | 20 | | 4 | 2 | 26 | 26 |
| 52 | | | | | | 34 | 1 | 7 | 8 | 50 | 50 |
| 53 | | | | | | 40 | 2 | 9 | 3 | 54 | 54 |
| 54 | | | | | | 58 | 2 | 4 | 6 | 70 | 70 |
| 55 | | | | | | 64 | 1 | 9 | 7 | 81 | 81 |
| 56 | | | | | | 72 | 2 | 15 | 9 | 98 | 98 |
| 57 | | | | | | 66 | 1 | 7 | 7 | 81 | 81 |
| 58 | | | | | | 88 | | 6 | 7 | 101 | 101 |
| 59 | | | | | | 85 | 1 | 11 | 10 | 107 | 107 |
| 60 | | | | | | 47 | 2 | 5 | 8 | 62 | 62 |
| 61 | | | | | | 55 | | 11 | 6 | 72 | 72 |
| 62 | | | | | | 62 | | 2 | 9 | 73 | 73 |
| 63 | | | | | | 41 | | 3 | 2 | 46 | 46 |
| 64 | 1 | | | | 1 | 30 | 1 | 6 | 2 | 39 | 40 |
| 65 | | | | | | 36 | 3 | | 1 | 40 | 40 |
| 66 | 1 | | | | 1 | 31 | | 2 | 3 | 36 | 37 |
| 67 | 1 | | | | 1 | 36 | | | 5 | 41 | 42 |
| 68 | 3 | 1 | | 1 | 5 | 33 | 1 | 1 | 13 | 48 | 53 |
| 69 | 9 | 1 | | 1 | 11 | 38 | 2 | 1 | 11 | 52 | 63 |
| 70 | 16 | | | 8 | 24 | 71 | 5 | 1 | 18 | 95 | 119 |
| 71 | 23 | 5 | | 3 | 31 | 67 | 3 | | 23 | 93 | 124 |
| 72 | 44 | 8 | | 13 | 65 | 99 | 12 | | 26 | 137 | 202 |
| 73 | 70 | 10 | | 14 | 94 | 125 | 10 | | 45 | 180 | 274 |
| 74 | 104 | 18 | | 23 | 145 | 149 | 18 | | 56 | 223 | 368 |
| 75 | 146 | 16 | | 24 | 186 | 197 | 25 | 1 | 51 | 274 | 460 |
| 76 | 204 | 12 | | 39 | 255 | 227 | 29 | | 78 | 334 | 589 |

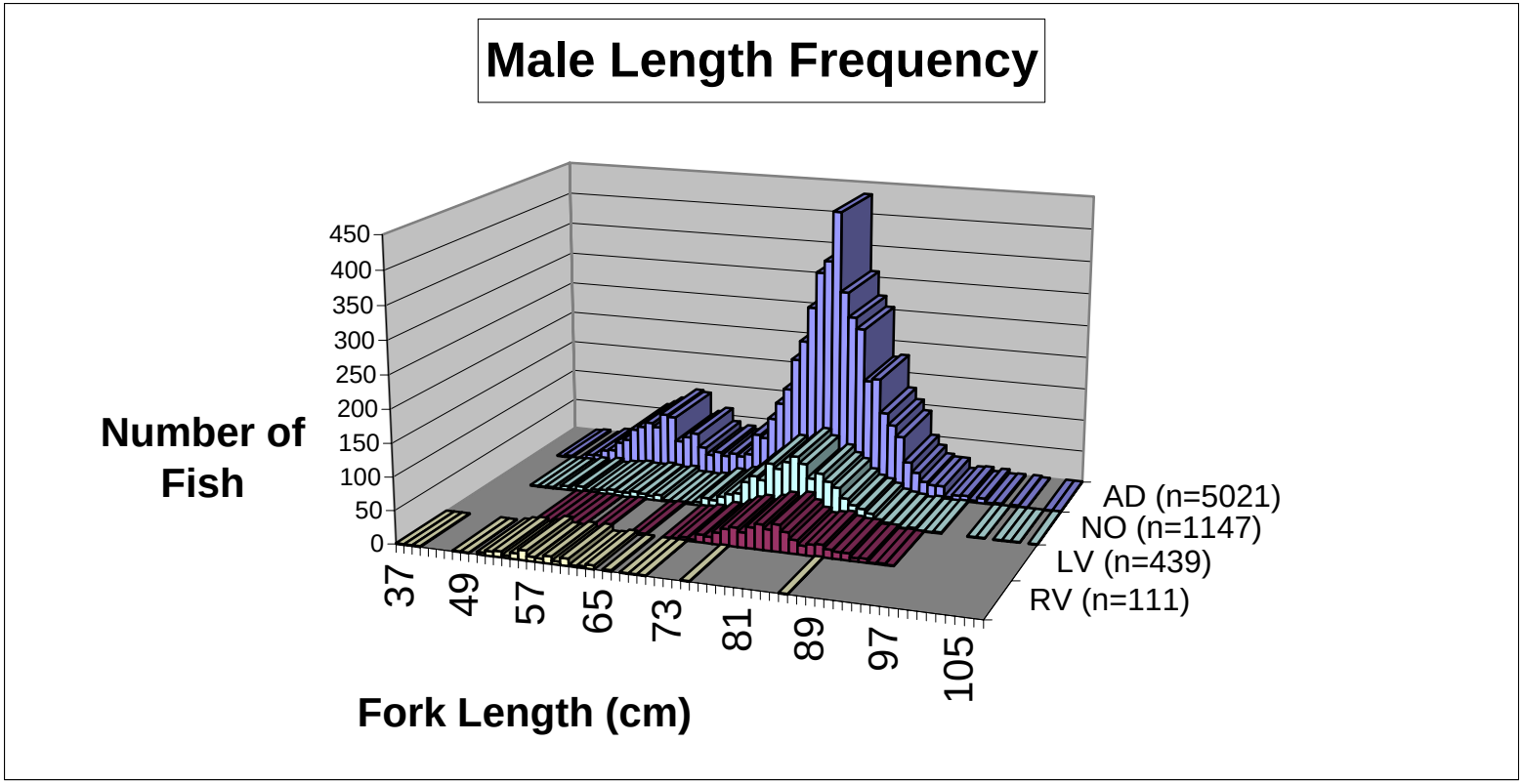
Appendix 3. continued

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 77 | 260 | 18 | | 42 | 320 | 281 | 23 | | 71 | 375 | 695 |
| 78 | 324 | 36 | | 76 | 436 | 336 | 32 | | 83 | 451 | 887 |
| 79 | 342 | 33 | 1 | 82 | 458 | 355 | 38 | | 93 | 486 | 944 |
| 80 | 462 | 33 | | 82 | 577 | 431 | 32 | | 83 | 546 | 1123 |
| 81 | 355 | 27 | | 58 | 440 | 309 | 41 | | 62 | 412 | 852 |
| 82 | 261 | 25 | | 44 | 330 | 271 | 31 | | 71 | 373 | 703 |
| 83 | 199 | 26 | | 33 | 258 | 254 | 21 | | 60 | 335 | 593 |
| 84 | 158 | 20 | | 24 | 202 | 174 | 14 | | 52 | 240 | 442 |
| 85 | 83 | 11 | | 21 | 115 | 178 | 17 | | 37 | 232 | 347 |
| 86 | 70 | 4 | | 19 | 93 | 126 | 19 | 1 | 28 | 174 | 267 |
| 87 | 29 | 6 | | 7 | 42 | 108 | 13 | | 24 | 145 | 187 |
| 88 | 15 | 3 | | 2 | 20 | 91 | 11 | | 18 | 120 | 140 |
| 89 | 17 | | | 1 | 18 | 52 | 11 | | 10 | 73 | 91 |
| 90 | 9 | 1 | | 4 | 14 | 37 | 5 | | 7 | 49 | 63 |
| 91 | 6 | 1 | | 2 | 9 | 24 | 6 | | 5 | 35 | 44 |
| 92 | 3 | | | 1 | 4 | 20 | 1 | | 2 | 23 | 27 |
| 93 | 6 | | | 2 | 8 | 20 | 2 | | 4 | 26 | 34 |
| 94 | 17 | | | | 17 | 4 | 1 | | 1 | 6 | 23 |
| 95 | 5 | | | 1 | 6 | 8 | | | 1 | 9 | 15 |
| 96 | 6 | | | 1 | 7 | 9 | | | 2 | 11 | 18 |
| 97 | 3 | | | | 3 | 3 | | | | 3 | 6 |
| 98 | 3 | | | 2 | 5 | 8 | | | | 8 | 13 |
| 99 | 2 | | | | 2 | 2 | | | | 2 | 4 |
| 100 | 1 | | | | 1 | 3 | | | 1 | 4 | 5 |
| 101 | | | | | | | | | 1 | 1 | 1 |
| 102 | | | | | | 3 | | | | 3 | 3 |
| 103 | | | | | | 1 | | | 1 | 2 | 2 |
| 104 | | | | | | | | | 1 | 1 | 1 |
| 105 | | | | | | | | | 1 | 1 | 1 |
| 106 | | | | | | 1 | | | | 1 | 1 |
| 107 | | | | | | 1 | | | 1 | 2 | 2 |
| **TOTALS** | 3258 | 315 | 1 | 630 | 4204 | 5021 | 439 | 111 | 1147 | 6718 | 10922 |

Appendix 4a. South Fork Salmon River female summer chinook length frequency graph BY01



Appendix 4b. South Fork Salmon River male summer chinook length frequency graph BY01

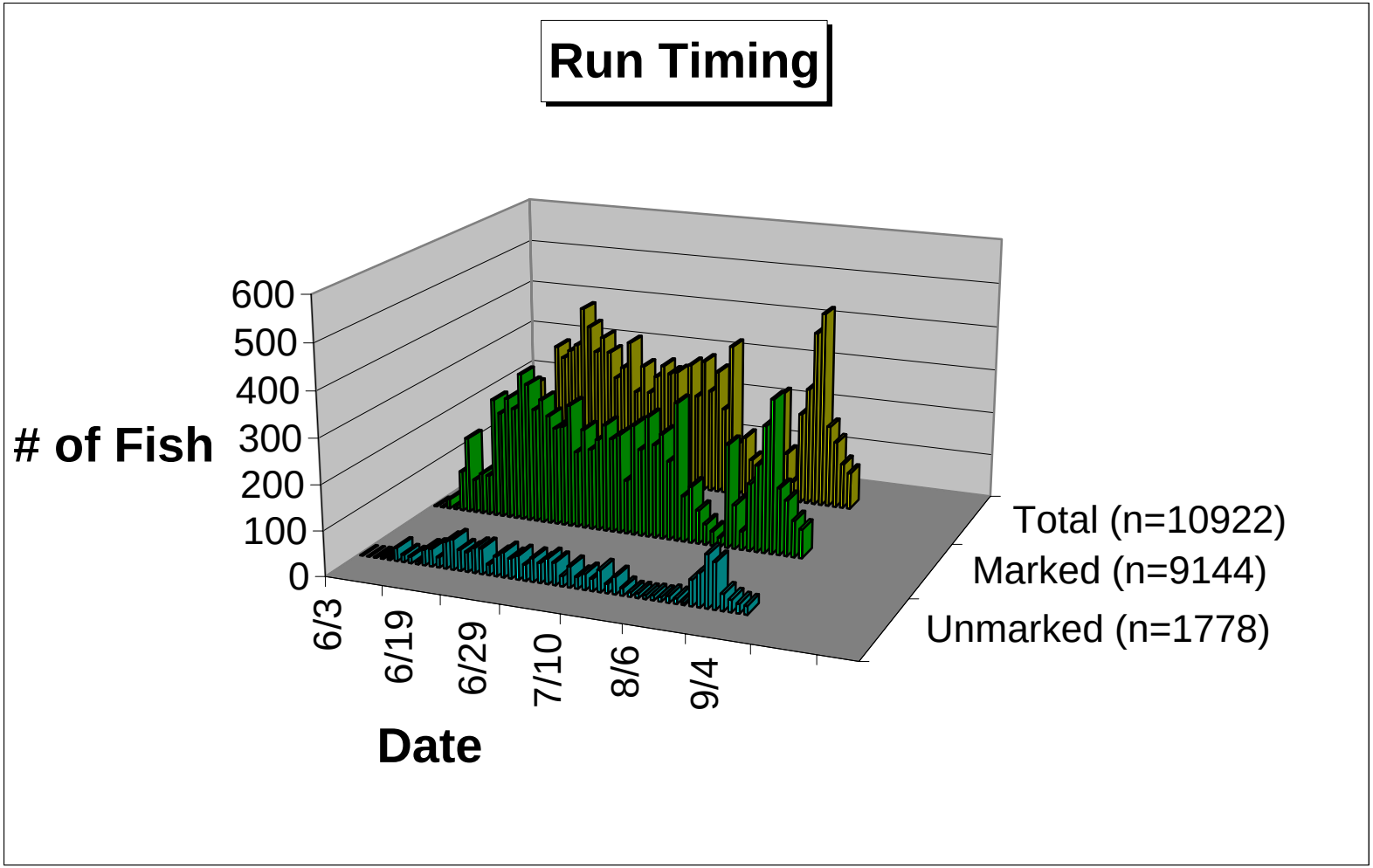


Appendix 5. McCall Fish Hatchery 2001 Summer Chinook run timing, South Fork Salmon River

| Date | Number Trapped | Date | Number Trapped |
|---|---|---|---|
| 6/3 | 1 | 8/28 | 399 |
| 6/5 | 1 | 8/29 | 445 |
| 6/8 | 22 | 8/31 | 187 |
| 6/9 | 12 | 9/4 | 152 |
| 6/11 | 97 | 9/7 | 103 |
| 6/12 | 201 | 9/10 | 84 |
| 6/13 | 93 | | |
| 6/14 | 107 | | |
| 6/15 | 96 | | |
| 6/18 | 303 | | |
| 6/19 | 278 | | |
| 6/20 | 297 | | |
| 6/21 | 312 | | |
| 6/22 | 400 | | |
| 6/23 | 359 | | |
| 6/24 | 301 | | |
| 6/25 | 336 | | |
| 6/26 | 303 | | |
| 6/27 | 244 | | |
| 6/28 | 270 | | |
| 6/29 | 331 | | |
| 6/30 | 216 | | |
| 7/1 | 278 | | |
| 7/2 | 218 | | |
| 7/3 | 258 | | |
| 7/4 | 285 | | |
| 7/5 | 268 | | |
| 7/6 | 273 | | |
| 7/7 | 145 | | |
| 7/9 | 294 | | |
| 7/10 | 222 | | |
| 7/11 | 306 | | |
| 7/12 | 238 | | |
| 7/13 | 285 | | |
| 7/14 | 199 | | |
| 7/16 | 348 | | |
| 7/19 | 121 | | |
| 7/23 | 137 | | |
| 7/27 | 86 | | |
| 8/1 | 56 | | |
| 8/6 | 44 | | |
| 8/8 | 31 | | |
| 8/10 | 246 | | |
| 8/17 | 111 | | |
| 8/21 | 47 | | |
| 8/24 | 208 | | |
| 8/27 | 268 | | |
| | | Totals | 10,922 |

Appendix 6. McCall Fish Hatchery South Fork Salmon River chinook run timing graph BY01





Appendix 7. Historic hatchery releases and returns logged at McCall Fish Hatchery.

| Brood Year | Release Year | Number of Fish | 3-year-olds | Year Returned | 4-year-olds | Year Returned | 5-year-olds | Year Returned | Percent Returned |
|---|---|---|---|---|---|---|---|---|---|
| 1978 | 1980 | 124,800 | 124 | 1981 | 462 | 1982 | 161 | 1983 | 0.598 |
| 1979 | 1981 | 248,926 | 48 | 1982 | 272 | 1983 | 221 | 1984 | 0.217 |
| 1980 | 1982 | 122,247 | 504 | 1983 | 713 | 1984 | 151 | 1985 | 1.119 |
| 1981 | 1983 | 183,896 | 595 | 1984 | 1,259 | 1985 | 203 | 1986 | 1.119 |
| 1982 | 1984 | 269,880 | 828 | 1985 | 1,265 | 1986 | 202 | 1987 | 0.850 |
| 1983 | 1985 | 564,405 | 1,222 | 1986 | 2,117 | 1987 | 893 | 1988 | 0.674 |
| 1984 | 1986 | 970,348 | 386 | 1987 | 1,392 | 1988 | 191 | 1989 | 0.255 |
| 1985 | 1987 | 958,300 | 50 | 1988 | 252 | 1989 | 30 | 1990 | 0.035 |
| 1986 | 1988 | 1,060,400 | 495 | 1989 | 911 | 1990 | 154 | 1991 | 0.147 |
| 1987 | 1989 | 975,000 | 28 | 1990 | 237 | 1991 | 25 | 1992 | 0.029 |
| 1988 | 1990 | 1,032,500 | 821 | 1991 | 2,617 | 1992 | 1,311 | 1993 | 0.030 |
| 1989 | 1991 | 708,600 | 206 | 1992 | 1,364 | 1993 | 299 | 1994 | 0.263 |
| 1990 | 1992 | 901,500 | 28 | 1993 | 158 | 1994 | 5 | 1995 | 0.021 |
| 1991 | 1993 | 607,298 | 70 | 1994 | 201 | 1995 | 37 | 1996 | 0.050 |
| 1992 | 1994 | 1,060,163 | 101 | 1995 | 424 | 1996 | 166 | 1997 | 0.065 |
| 1993 | 1995 | 1,074,598 | 738 | 1996 | 3,448 | 1997 | 555 | 1998 | 0.441 |
| 1994 | 1996 | 585,654 | 45 | 1997 | 343 | 1998 | 817 | 1999 | 0.206 |
| 1995 | 1997 | 238,367 | 76 | 1998 | 42 | 1999 | 90 | 2000 | 0.087 |
| 1996 | 1998 | 393,872 | 115 | 1999 | 3,306 | 2000 | 263 | 2001 | 0.935 |
| 1997 | 1999 | 1,182,615 | 3,416 | 2000 | 9,565 | 2001 | 971 | 2002 | 1.179 |
| 1998 | 2000 | 1,039,930 | 1,094 | 2001 | 6494 | 2002 | 0 | 2003 | 0.000 |
| 1999 | 2001 | 1,165,231 | 1,138 | 2002 | 0 | 2003 | 0 | 2004 | 0.000 |
| 2000 | 2002 | 1,064,250 | 0 | 2003 | 0 | 2004 | 0 | 2005 | 0.000 |
| 2001 | 2003 | 1,053,660 | 0 | 2004 | 0 | 2005 | 0 | 2006 | 0.000 |

Appendix 8. Summer chinook distribution in the South Fork of the Salmon River logged at McCall Fish Hatchery

| Destination | Weight | Number/pound | Number released |
|---|---|---|---|
| Knox Bridge | 12,875 | 21.12 | 271,860 |
| Knox Bridge | 12,800 | 21.12 | 270,280 |
| Knox Bridge | 12,875 | 21.12 | 271,860 |
| Knox Bridge | 11,350 | 21.12 | 239,660 |
| **Total Released** | **49,900** | | **1,053,660** |

Appendix 9. Brood year 2001 summer chinook survival from green eggs to released smolts

| Number of Green Eggs | Number of Eyed Eggs | Percent Survival | Ponded | Percent Survival | Released Smolts | Percent Survival |
|---|---|---|---|---|---|---|
| 1,793,667 | 1,139,385 | 74.80% | 1,056,518 | 72.40% | 1,053,660 | 72.20% |

*Totals do no include culled eggs from green egg total, and parr to Stolle Pond

Appendix 10. Temperature range from August 2001 through April 2003 at McCall Fish Hatchery

| Date | Temperature |
|---|---|
| Aug-01 | 50.7 |
| Sep-01 | 48.2 |
| Oct-01 | 45.5 |
| Nov-01 | 44.5 |
| Dec-01 | 38.5 |
| Jan-02 | 37.8 |
| Feb-02 | 38.0 |
| Mar-02 | 38.0 |
| Apr-02 | 38.0 |
| May-02 | 41.7 |
| Jun-02 | 47.7 |
| Jul-02 | 53.0 |
| Aug-02 | 51.8 |
| Sep-02 | 49.5 |
| Oct-02 | 45.6 |
| Nov-02 | 43.1 |
| Dec-02 | 40.2 |
| Jan-03 | 38.0 |
| Feb-03 | 38.2 |
| Mar-03 | 38.2 |
| Apr-03 | 38.2 |

Appendix 11. Water analysis at McCall Fish Hatchery.

| Date | pH | Ammonia | Nitrate | Nitrite | Total Phosphate | Total Nitrogen | KJEL Hardness | $CaCO_2$ Saturation | Oxygen ppm |
|---|---|---|---|---|---|---|---|---|---|
| 1988 | 6.8 | - | - | - | - | - | <10 | 97/103 | 7/10 |
| 1991 | | <0.05 | <0.1 | <0.1 | <0.05 | <0.10 | | | |
| 1993 | 6.9 | <0.05 | <0.1 | <0.01 | <0.05 | <0.10 | | | |
| 1994 | 6.9 | <0.05 | <0.1 | <0.01 | 0.01 | <0.10 | | | |

Appendix 12. Brood year 2001 production cost table.

| Number of Fish | Pounds of Feed | Cost of Feed | Pounds of Fish | Conversion | Total Cost | Cost/ 1,000 | Cost/ Pound |
|---|---|---|---|---|---|---|---|
| 1,115,260 | 67,336.00 | $67,070 | 50,394 | 1.37 | $471,623 | $422.98 | $9.35 |

Includes the Stolle Pond fish.

Appendix 13. Brood year 2001 marked fish released.

| Date | Number of Marks Applied | Mark | Purpose | Number Marked Fish Released | Site/group Released |
|---|---|---|---|---|---|
| 6/03-6/11/02 | 769,023 | AD | Identification | 632,492 | 1,053,660 |
| 7/08-7/15/02 | 347,993 | AD/CWT | US-Canada | 346,610 | 1,053,660 |
| 2/19-3/01/02 | 74,597 | AD/PIT | Migration | 74,558 | 1,053,660 |
| 7/08-7/15/02 | 61,822 | CWT | Supplementation | 61,800 | 1,053,660 |
| 7/08-7/15/02 | 600 | CWT | Supplementation | 600 | 1,053,660 |
| **Total** | **1,254,035** | | | **1,115,460** | **1,053,660** |

Appendix 14a. Summary of fish autopsy

**Summary of Fish Autopsy**

| | | | |
|---|---|---|---|
| ACCESSION NO: | 03-084 | LOCATION: | MCCALL |
| SPECIES: | SU | AUTOPSY DATE: | 3/14/2003 |
| STRAIN: | JC | AGE: | juv |
| UNIT: | P1 | SAMPLE SIZE: | 20 |
| RIVER FOR AUTOPSY: | Prelib. | | |
| INVESTIGATOR(S): | Munson | | |
| REMARKS: | | | |

| | MEAN | STANDARD DEVIATION | COEFFICIENT OF VARIATION |
|---|---|---|---|
| LENGTH | 0.00 | 0.00 | 0.00 |
| WEIGHT | 0.00 | 0.00 | 0.00 |
| KTL* | 0.00 | 0.00 | 0.00 |
| CTL* | 0.00 | 0.00 | 0.00 |
| HEMATOCRIT | 46.20 | 3.10 | 0.07 |
| LEUCOCRIT | 0.00 | 0.00 | 0.00 |
| SERUM PROTEIN | 8.80 | 0.99 | 0.10 |

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOUTH POWER

| EYES | | GILLS | | PSEUDO-BRANCHS | | THYMUS | | FAT | | MESEN. SPLEEN | | GUT | | HIND KIDNEY | | LIVER | | BILE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 20 | N | 20 | N | 20 | 0 | 20 | 0 | 0 | B | 5 | 0 | 20 | N | 20 | A | 15 | 0 | 0 |
| B1 | 0 | F | 0 | S | 0 | 1 | 0 | 1 | 2 | R | 15 | 1 | 0 | S | 0 | B | 3 | 1 | 0 |
| B2 | 0 | C | 0 | L | 0 | 2 | 0 | 2 | 6 | G | 0 | 2 | 0 | M | 0 | C | 2 | 2 | 0 |
| E1 | 0 | M | 0 | S&L | 0 | | | 3 | 98 | NO | 0 | | | G | 0 | D | 0 | 3 | 0 |
| E2 | 0 | P | 0 | I | 0 | Mean=0.00 | | 4 | 2 | E | 0 | Mean=0.00 | | U | 0 | E | 0 | | |
| H1 | 0 | OT | 0 | OT | 0 | | | | | OT | 0 | | | T | 0 | F | 0 | Mean=0.00 | |
| H2 | 0 | | | O | 0 | | | Mean=2.45 | | | | | | | | OT | 0 | | |
| M1 | 0 | | | | | | | | | | | | | | | | | | |
| OT | 0 | | | | | | | | | | | | | | | | | | |

**SUMMARY OF NORMALS**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 0 |
| SEX | M: 0 | | F: 0 | | U: 0 | | | | |

**GENERAL REMARKS:**

FINS: GONADS:

SKIN: OTHER:

Appendix 14b. Summary of fish autopsy

**Summary of Fish Autopsy**

| | | | |
|---|---|---|---|
| ACCESSION NO: | 03-085 | LOCATION: | MCCALL |
| SPECIES: | SU | AUTOPSY DATE: | 3/14/2003 |
| STRAIN: | JC | AGE: | juv |
| UNIT: | P1 | SAMPLE SIZE: | 20 |
| RIVER FOR AUTOPSY: | Prelib. | | |
| INVESTIGATOR(S): | Munson | | |
| REMARKS: | | | |

| | MEAN | STANDARD DEVIATION | COEFFICIENT OF VARIATION |
|---|---|---|---|
| LENGTH | 0.00 | 0.00 | 0.00 |
| WEIGHT | 0.00 | 0.00 | 0.00 |
| KTL* | 0.00 | 0.00 | 0.00 |
| CTL* | 0.00 | 0.00 | 0.00 |
| HEMATOCRIT | 45.10 | 3.30 | 0.69 |
| LEUCOCRIT | 0.00 | 0.00 | 0.00 |
| SERUM PROTEIN | 8.50 | 0.88 | 0.12 |

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOUTH POWER

| EYES | | GILLS | | PSEUDO-BRANCHS | | THYMUS | | FAT | | MESEN. SPLEEN | | GUT | | HIND KIDNEY | | LIVER | | BILE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 20 | N | 20 | N | 20 | 0 | 20 | 0 | 0 | B | 0 | 0 | 20 | N | 20 | A | 10 | 0 | 0 |
| B1 | 0 | F | 0 | S | 0 | 1 | 0 | 1 | 4 | R | 20 | 1 | 0 | S | 0 | B | 8 | 1 | 0 |
| B2 | 0 | C | 0 | L | 0 | 2 | 0 | 2 | 6 | G | 0 | 2 | 0 | M | 0 | C | 2 | 2 | 0 |
| E1 | 0 | M | 0 | S&L | 0 | | | 3 | 8 | NO | 0 | | | G | 0 | D | 0 | 3 | 0 |
| E2 | 0 | P | 0 | I | 0 | Mean=0.00 | | 4 | 1 | E | 0 | Mean=0.00 | | U | 0 | E | 0 | | |
| H1 | 0 | OT | 0 | OT | 0 | | | | | OT | 0 | | | T | 0 | F | 0 | Mean=0.00 | |
| H2 | 0 | | | O | 0 | | | Mean=2.2 | | | | | | | | OT | 0 | | |
| M1 | 0 | | | | | | | | | | | | | | | | | | |
| OT | 0 | | | | | | | | | | | | | | | | | | |

**SUMMARY OF NORMALS**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 0 |
| SEX | M: 0 | | F: 0 | | U: 0 | | | | |

**GENERAL REMARKS:**

FINS: GONADS:

SKIN: OTHER:

**Submitted by:**

Donald E. McPherson
Fish Hatchery Manager II

Steven Kammeyer
Assistant Fish Hatchery Manager

Joel Patterson
Fish Culturist

Doug Munson
Fish Pathologist

**Approved by:**

_____
Virgil K. Moore, Chief
Fisheries Bureau

_____
Tom Rogers
Anadromous Fish Hatchery Manager